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ABSTRACT

Sixteen white home-reared babies (eight boys - eight girls) ranging in age from six months to two years were studied during home visits. Piaget's sensory-motor development theory of imitation was employed, and his special thesis of the hierarchical sequence was tested. The examiner proposed four critieria for assessing the development of imitation during this period: (1) accuracy of the imitation, (2) speed at which imitations are acquired, (3) complexity of imitation infant is capable of acquiring, and (4) novelty of the imitation. Findings conformed to the Guttman quasi-simplex correlation matrix, and demonstrated existence of a developmental sequence. The examiner proposes further investigations relating imitation during the sensory-motor period to application of measures of affective development. (Author)

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The Development of Imitation in Piaget's Sensory-Motor Period of Infant Development (Stages III - VI)

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The present study was designed as a cross-sectional investigation of imitation in infancy. The study employed the theoretical framework of Piaget's sensory-motor development of imitation, and was designed to test two hypotheses: 1) that one can reliably observe and describe characteristic forms of imitation in infancy, 2) that Piaget's description of the development of imitation during the sensory-motor period provides an unusually detailed and potentially fruitful method of describing and arranging imitative acts within a hierarchical sequence during the stages of infancy postulated within his general theory.

The study was comprised of sixteen white home-reared babies (eight boys and eight girls), ranging in age from six months, sixteen days to two years, one month and four days. The experimenter employed home visits and an unstructured format for testing, both of which will be discussed in turn.

Testing was scheduled at the mother's suggestion in order to fit into the daily schedule of the infant. E's concern for the schedule of the infant was to find a time in which the child was usually active and would be

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conducive to testing. Since this was an observational study E wished to make the situation as normal for the child as possible. Testing the children at home, using objects they were familiar with, playing in surroundings they were comfortable with, and eliciting the mothers' participation seemed to E the most likely way to properly assess a full and representative sampling of the child's imitative ability. Moreover, during testing, E made a point of having only one adult, namely the mother, present. E felt that in a situation in which a stranger (namely E) was present the mother might feel inhibited by the presence of another adult. This inhibition might be manifest in her attention and liveliness as directed to the infant and also in the establishment of her rapport with the experimenter.

E employed an unstructured testing procedure to enable him to elicit as full and representative a sampling of the child's imitations as possible. Testing was organized around the ongoing behavior and interests of the child. E's observations of the child's behavior and interests were important to his testing because he did not want to bore the child by repetitive forms of imitation that were too commonplace for the child, nor did he want to lose that child's interest by imitations that were too difficult. In essence, testing was performed in

a play situation as comfortable for the child as possible.

In general, the findings of this investigation supported the hypotheses of the study. The methodology in this study yielded a wealth of observations that were sufficiently detailed to allow assessment of the developmental stage they represented. Furthermore, Piaget's description of the development of imitation during the sensory-motor period (in Play, Dreams and Imitation in Childhood) generally provided sufficient information to assess the observations of imitation. To aid in this assessment of the development of imitation the experimenter proposed four criteria for evaluating the observations of imitation. These criteria are: 1) the accuracy of the imitation, 2) the speed at which the imitations are acquired accurately (this may be conceived of as the number of practices the infant must make before he has acquired an accurate imitation), 3) the complexity of the imitation the infant is capable of acquiring (in operational terms, how many separate actions an accurate imitation entails), and 4) the novelty of the imitation (is the behavior required for an accurate imitation already part of the infant's repertoire, is it similar to existing behavior the infant has demonstrated, or have the behaviors required not been exhibited by the infant before this imitation).

In support of the four general criteria E has proposed for the assessment of imitation, the following examples have been compiled and are presented in stage categorized form.

(see "Selected Sequences Demonstrating the Development of Imitation")

The method E felt applicable to statistically assess the sequential stages of the development of imitation as proposed by Piaget was the Guttman quasi-simplex correlation matrix. The data from which this matrix was derived was the number of observations, categorized into appropriate stages, for each infant, and the percentage profiles derived from these raw scores.

(see Table I)

With regards to the matrix itself,

(see Table II)

the expectation is that the correlation between two types

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of imitation should become more negative as these two types are increasingly separated in the developmental hierarchy (i.e. the correlation should become more negative as one moves away from the diagonal entries either along the columns - across the rows).

As can be seen, the matrix presented is in general agreement with our expectation. The result that necessitated the qualifications of "general agreement" is the correlation of stage III and stage VI (-.442) which is a less negative correlation than the correlation between stages III and V and IV and VI (-.542 and -.684, respectively). Robert Wherry (private communications) attributes this to inadequate sampling procedures. Presumably, if there had been more infants of age six to eight months who might display percentage profiles similar to the percentage profiles of infant 0:6:16, then the correlation might be expected to be more negative and agree more completely with our expectations.

Owing to the success of this study's hypotheses, the experimenter proposes further investigations of imitation during the sensory-motor period with the application of measures of affective development to assess the correlation between the cognitive and affective realms. It is E's proposal that such a correlation between an infant's level of development of imitation in relation to his

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play and the quality of various aspects of mother-infant interaction should be positively correlated. Possible aspects of the mother-infant interaction that may be studied are (as proposed by Mary D. Salter Ainsworth, Sylvia M. Bell, and Donelda Stayton): 1) acceptance versus rejection, 2) cooperation versus interference, 3) sensitivity versus insensitivity to the baby's communications, and 4) accessibility versus ignoring and neglecting.

Selected Sequences Demonstrating the Development of Imitation

Stage	Age	Example
III	0:9:14	M (Mother) sticks tongue out at B (Baby)/ B sticks tongue out at M (B had been sticking tongue out on and off before this observation)
IVa	1:9:4	B sticks tongue slightly out and off to one side, just like his father
III	0:6:16	B coughing/ O (Observer) coughs/ B continues a forced cough as O coughs in unison
IVa	1:0:15	B sneezes and drops her head/ O fakes a sneeze and drops his head/ B smiles and fakes a sneeze and drops her head - repeated a few more times with obvious enjoyment on both B's and O's parts
III	1:0:26	M goes like an Indian/ M takes B's hand and pats B's mouth with it as B vocalizes along
V	1:1:20	M goes like an Indian, patting her mouth and saying "woo-woo"/ B pats her mouth and says "woo-woo"
IVb	0:9:14	M spins wheel/ B grabs at wheel but wheel is at right angles to B and B's simple grasping will not spin the wheel/ O adjusts Busy box so that the outer rim of the wheel is directly in front of B/ B is able to spin wheel by simply grasping and pulling the top of the wheel to herself
V	1:3:1	O spins wheel/ B spins wheel
IVb	0:9:2	M dials toy phone/ B attempts to turn dial but really only succeeds in pounding dial
V	1:0:26	O dials the telephone with one finger extended/ B extends one finger and touches the dial but does not succeed in turning it
IVb	0:9:14	O depresses hinged clip on clipboard/ B places whole hand on clip and grasps it; later on, B places one finger on end of clip but does not press down or move clip back and forth
V	1:3:1	O snaps his hinged clip of his clipboard and also moves clip back and forth, all done with one finger/ B extends one finger and moves clip back and forth and attempts to press it down
IVb	0:9:9	O turns hour glass over repeatedly, letting sand run out each time/ B seems quite fascinated, but when sand runs out B will only knock hour glass on its side
V	1:0:15	O turns hour glass upside down a few times, allowing the sand to run through each time/ B watches

Stage	Age	Example
		with interest, then takes the hour glass from O and runs the sand through herself a few times
		**********
IVb	1:0:26	M hides her face from B and then uncovers her face/ when M uncovers her face, B acts surprised and delighted
V	1:3:19	M covers her eyes, then uncovers her eyes/ B covers his eyes and uncovers his eyes
VI	1:9:4	O covers his face with a cloth and then uncovers it/ while O holds out the sheet for B, B puts his face to it and then pulls away in a game of peek-a-boo
		**********
IVb	0:9:0	O stacks blocks/ B does not carefully stack blocks but does slap them carelessly upon each other
V	1:1:20	O places one block upon another/ B does likewise but does not place the blocks as squarely on another as O had
VI	2:1:4	B continues playing with his blocks and builds another form, spontaneously - a yellow base with five rectangular blocks lined up in a row, touching each other, on top of it/ M exclaims with surprise that this was exactly the same arrangement of blocks she had built last night, and that B had not done this last night
		**********
IVb	1:0:26	O and then S (Sibling) drop a geometric shape (circle) through its proper hole/ when given the shape and offered the proper hole to place it in, B at first just touches the area with the shape and drops the circle, then B makes a slight attempt to adjust the circle to the hole but does not succeed
V	1:3:23	B will place proper geometric shapes into their proper holes when M has just chosen that hole
VI	1:9:4	B can recognize geometric shapes and will drop them through the proper geometric holes

Table I

Raw Scores and Percentage Profiles of Observations of Imitation for Each Infant Categorized into Appropriate Stages (Raw Scores/Percentages)

Age	Stage III	Stage IV	Stage V	Stage VI
0:6:16	7/70	3/30		
0:9:0	3/18.7	13/81.3		
0:9:2	7/35.0	13/65.0		
0:9:14	3/17.6	12/70.6	2/11.8	
1:0:7	1/5.0	6/30.0	13/65.0	
1:0:15	2/5.8	15/42.8	18/51.4	
1:0:26	3/13.0	12/52.2	8/34.8	
1:1:20	4/12.1	9/27.3	20/60.6	
1:2:21		11/42.3	14/53.3	1/3.8
1:3:1	3/13.6	7/31.8	12/54.6	
1:3:19	1/5.2	5/26.3	13/68.4	
1:3:23	1/4.5	7/31.8	8/36.3	6/27.2
1:5:7		3/10.0	10/33.3	17/56.6
1:7:21		2/9.5	9/42.8	10/47/6
1:9:4		3/13.0	5/21.7	15/65.2
2:1:4		2/9.0	2/9.0	18/81.8

Table II

Matrix of Intercorrelations Between Four Stages
In Piaget's Sensory-Motor Development
of Imitation

	III	IV	V	VI
III	x			
IV	.347	x		
V	-.542	-.369	x	
VI	-.442	-.684	-.219	x